

## ON MAMMALS FROM THE LAKE EYRE BASIN.

## PART I.—THE DASYURIDAE.

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The reappearance of *Caloprymnus campestris*, in 1931,<sup>(1)</sup> in the eastern portions of the Lake Eyre Basin, was not an isolated episode in the history of the local mammals, but was rather the outcome of causes largely connected with the passing of drought conditions, which by restoring herbage over large denuded areas, led to a sudden marked increase in the numbers of most of the smaller mammals and culminated in one of the now familiar migratory rodent plagues.

While matters appertaining to *Caloprymnus* were the chief pre-occupation of the writer while there, no opportunities were lost of obtaining a representative collection of all the local mammals, and since my departure, several generous correspondents have made important additions both of material and data. For services in this connection I am particularly indebted to Mr. L. Reese, to Mr. H. R. Adamson of Elder, Smith & Co., to Mr. Shelton, of Cordillo, Master Dick Scobie, Constable John Finn, Mr. George Aiston and Mr. D. N. George.

While the collections so formed fall far short of that necessary for an adequate survey of the mammals of this remarkable area, they have brought to light several new forms, and in other cases adequate series of specimens have enabled me to add to knowledge of animals, formerly obscure, owing to their rarity in collections.

The area from which most of the data and specimens herein recorded were derived, comprises the extreme north-eastern corner of the State of South Australia, and may be approximately defined by producing the western and southern boundaries of Queensland into South Australian territory until they meet, near the south-eastern corner of Lake Eyre North. Within this square, again, work was concentrated largely on the tracts between the Barcoo and Diamantina, which for various reasons are more suitable for collecting.

Hitherto, collecting here has been of a desultory and incidental character and, owing to the insignificance numerically, of its mammal population in normal years, to the decline of the blacks and consequent loss of expert aid, and the rigours of climate, the country is not one of many attractions to the mammalogist. It is, nevertheless, an area of great interest ecologically and, on the rare occasions of a resurgence of life, well repays the considerable amount of energy which one must spend upon it in order to get results.

The Physical features of the area are highly characteristic, and together constitute a type of environment distinct from other parts of the centre. Four main physiographical units may be recognised which, to a slight extent, are valid also as zones of distribution.

(1) Parallel sand ridges, usually north and south in direction and frequently of great linear extent, but disposed in narrow belts seldom more than a mile or so wide and frequently limited to a single ridge, which may extend unbroken for 20 or 30 miles. These long ridges are permanent and arc, indeed, not sandhills

<sup>(1)</sup> Trans. Roy. Soc. S. Aust., vol lvi. (1932), pp. 148-167.

proper, but loamy elevations blanketed to varying depths with loose sand. Near the east shores of the Lake, however, and south of the Barcoo, are true drifting dunes with no firmer core.

(2) Loamy flats. These may take the form of long strips constituting the interspaces of the sand ridge belts or may be more extensive depressed areas or basins, like Goyder's lagoon. In the former case the surface supports small herbaceous plants only, but in the latter there is usually a fairly dense growth of the so-called lignum (*Muehlenbeckia Cunninghamii*), which sometimes attains 10 feet in height, and then constitutes the nearest approach to a thicket to be found in the district.

(3) The gibber plains. In their surfaces these vary in texture from a loose rubble, which may support a small bush flora, to closely arranged pavements from which are excluded all but the grasses, which, however, are only in evidence after heavy rains. In extent, they may range from a few acres, to huge expanses like Sturt's Stony Desert, extending 120 miles north and south and width up to 35 miles.

(4) The river channels. Although the first three types of country alternate with one another so as to account for the greater part of the land surface, the river channels of the Diamantina and Barcoo, while involving but trifling areas in their normal courses, are, nevertheless, of interest as affording the only permanent waters of the area and the only considerable belts of timber, their banks being lined with Coolibah and *Bauhinia*. From the point of view of distribution these features form a minor but sharply defined habitat zone, to which the single aquatic and the single arboreal mammal of the area are exclusively restricted.

Away from the river channels, the whole surface, sandhills, flats and gibber plains is characterised by excessive aridity and high temperatures throughout the greater part of the year. The vegetation, which has been dealt with in detail by Cleland, Black, and Reese,<sup>(2)</sup> is sparse, made up almost entirely of very small species, and so scattered as to leave the ground surface nearly naked. In spite of this quantitative deficiency, however, there is a large percentage of good fodder plants, and nominally the whole area is taken up for pastoral purposes, but this enterprise is not carried on with sufficient concentration to affect the flora and fauna appreciably, except in a few restricted localities.

The almost complete absence, away from the channels, of arborescent plants or of species forming moderately compact communities, is a striking feature, and the resulting absence of shade and shelter is, no doubt, largely responsible for the elimination from the mammals, of almost all but strictly fossorial forms.

The conditions mentioned impose upon the area a strongly developed eremian character, which, however, is curiously modified in certain parts from time to time, by the flooding of the Diamantina and Barcoo by rains in the Queensland hills, 700 miles away. At such times large areas of the loamy flats contiguous to the channels are inundated, and may remain so for weeks at a time. When the water is absorbed herbage is quickly restored on a scale of unwonted lavishness, which leads in turn to a corresponding increase in animal life, similar (if more localized) to that which follows a general rain.

In the portions of the district remote from these influences, the prevailing colour of the gibbers and the sand alike is a rich ferruginous brown, but in the flooded areas this becomes bleached to a pale drab. The flooded country is but a small fraction of the total area of the Basin, but is, nevertheless, its chief mammal station, and the colour change mentioned is a significant one in local bionomies, since there is little doubt that the curious ochraceous pallor which distinguishes

<sup>(2)</sup> Trans. Roy. Soc. S. Aust., vol. xlix. (1925), p. 103.

the colouration of nearly all its small mammals, is a character adapted to the prevailing tone of the landscapes.

The rivers have a further interest in that they tend in some measure to break down the geographic isolation of the Basin, and they are, potentially at least, intermittent lines of communication linking this portion of the Eremian Sub-region with the Torresian half of the Euronotian belt. Although they are no longer regular lines of migration so far as the mammals are concerned, it is probable that two species of rodents gained access to the Lake Eyre Basin by this route at no very distant time.

SMINTHOPSIS CRASSICAUDATA CENTRALIS (Thomas).

"Nilee" of the Wonkonguroo.<sup>(3)</sup>

Ordinarily, apparently, an uncommon or even rare animal in the district, but multiplying to an extraordinary extent during the mouse plagues of 1930-1932 and following the migratory waves of *Mus musculus* from north to south throughout the area. At the same time local increases in the numbers of the typical variety took place in the settled districts, as for example at Mildura and Renmark on the Murray.

There seems no reason for doubt that at these times it forsakes its ordinary insectivorous habit and becomes truly carnivorous and predatory. Though I cannot vouch personally for any instances of its killing mice, stories of its enterprise and ferocity in so doing are admirably told by blacks and whites alike. At the height of the plague in 1931, Mr. Reese took scores of Nilees inadvertently in improvised kerosene tin mouse traps, and when so caught it at once proclaims its presence by its remarkably loud shrill hissing cry.

Throughout the summer of 1931 it lived in shallow burrows on all types of country, but Mr. Aiston tells me that in the early part of 1932, at Mulka, while breeding freely, it was found in nests on the surface. With the subsidence of the mouse plagues it disappeared as suddenly as its prey, but the taking of specimens from holes in the following winter, in a sluggish condition very different from its usual vivacity, suggests that a partial hibernation may partly explain the mystery, though attempts to induce hibernation in this and allied species, in captivity, have met with no success.

The general colour of the type of the variety *centralis*, which came from Killalpannina on the Barcoo, was stated by Thomas, to be a pale isabella finely grizzled with brown, but the ground colour of the dorsum, in the present series of 22, is remarkably inconstant, and varies from a curious brassy "olive buff" through several shades of buffy grey to a rich vinaceous cinnamon. The differences do not appear altogether capriciously, however, but represent to some extent at least, adaptations to the prevailing colour of the environment during periods when the *Sminthopsis* population is stationary. The paler forms appear in the bleached sandhill-claypan country near the channels, and the richer pink forms in the red gibber plains.

From *S. crassicaudata*, as it occurs in the South-Eastern district of South Australia (where it is more plentiful, normally, than elsewhere in the State), the variety *centralis* differs markedly, not only in its brighter colouration but in some structural features as well.

The bodily size is very variable in both localities, but the central form is lighter in build and with longer limbs and appendages. The ear is not only pro-

<sup>(3)</sup> The aboriginal names quoted are, in most cases, those used by Wonkonguroo hunters, but in many cases are not original to that people but have been borrowed from the Yalliyandas, Yaurorkas and Dieries.

portionately much longer<sup>(4)</sup> but is broader as well, and the total area of the pinna is thus greatly increased. The tip, moreover, is more sharply pointed and the whole feature more prominent than in the south. The curious trizoned pigmentation of the epidermis of the ear, apparently characteristic of the species over the whole of its range, is on the same pattern as in true *crassicaudata* but is much more marked, as are also the similar pigmented areas on the mystical sites of the muzzle. The tail is from 50-60% longer. Its inerassation in this species, in all parts of South and Central Australia, is so variable as to render it useless as a diagnostic feature, but in *centralis* its maximum development is greater than in the southern form. In life the epidermis of the tail is pigmented a dark slate, but in alcohol this fades rather quickly.

The manus shows little change, but the pes is larger; its naked granular portion extends obliquely as a wedge-shaped strip from a point just proximal to the hallux, to the bases of the nails. A feebly developed hallucal pad is sometimes present. The main interdigital pads are granular, but there is a distinct tendency for the midline of their surfaces to be occupied by a single longitudinal series of enlarged granules, whereas in the southern form the pads are more finely granulated and without any regular arrangement of granules.<sup>(5)</sup>

It has not been expedient to extract skulls from the whole series, but 6 have been examined, and these would appear to indicate that in *centralis* the canine is slightly longer, the disproportion in size of the premolars less, and the posterior margins of the nasals more sharply angulated, than in the southern *crassicaudata*. These differences are slight, however, and the chief skull measurements may be merged with those of the southern animal.

The skull of one of the largest males gives:—Basal length, 23·3; zygomatic breadth, 13·3; nasals length, 9·9; intertemporal, 4·7; palate length, 12·8;  $M^{s1-3}$ , 4·5.

In the series examined (22), males outnumber females by 2 to 1.

Mammae either 8 or 10.

The form of *S. crassicaudata*, which occurs in the south-east of South Australia, may apparently be reconciled with the typical variety of Gould's original description. The differences which separate it from *centralis*, over 1,000 miles north in a very different environment, are so marked as to suggest the propriety of separating the latter specifically from the earlier known animal.

In testing the grounds on which such a step might be taken, I have been led to examine all the specimens in the South Australian Museum (some 50 in all), which come from intermediate and still more northerly localities. While there is a considerable individual variation which is responsible for the occasional appearance of similar individuals at widely sundered places, the chief result of this analysis has been to reveal a steady change in colouration, and in the length of tail and ear, as one proceeds from south to north, together with the retention, almost unmodified, of skull characters, foot structure and pattern of markings.

The intergrading of the variable features is so complete as to leave little doubt as to the derivative relations of the whole series, and anything more than sub-specific distinctions are thus unjustified.

<sup>(4)</sup> The form from the southern parts of the State was stated by Wood-Jones to be longer eared than that from more arid Northern districts (Mammals of S. Aust., vol. i., p. 114). I am unable to confirm this, however, by reference to the series preserved here, and the specimens from the Adelaide district, of which measurements are given, have a proportionately much shorter ear than the form now under consideration (in the ratio of 14:20·4).

<sup>(5)</sup> Occasionally a single large granule may occur on the surface of the pad, but the disproportion between it and its fellows is usually not great and it does not always occur on the point of contact of the pad with the ground—it is an aberration, rather than a functional specialization such as occurs in *S. larapinta*.

Beginning in the south-eastern district with a cold, ashy grey, short eared and very short tailed form, there is, on coming north, a steady increase both of the fulvous colours of the coat and of the length of ear and tail. In the northern mallee, and on Yorkc and Eyre Peninsula, distinctly yellowish forms are already met with which, at Kooringa, Kingoonya, Copley and Farina, on saltbush tablelands, change to a bright tan, noticeably long-tailed form, and the trend culminates in the Macdonnell Range with the production of a brilliant ferruginous phase,<sup>(6)</sup> with distinctly yellowish ventral fur and dimensions identical with those of the Diamantina specimens.

In point of colour the pallid buff and vinaceous tones of the latter stand somewhat apart from this sequence, and have obviously been developed in response to the peculiar conditions of the Basin. If, therefore, the name *centralis* is retained for the pallid form of this area, it will be necessary to accord an equal degree of distinction to the richly-coloured variety which diffuses south from the Macdonnells and which is equally distinct from the true *crassicaudata* of the south.

It may be called, provisionally, *Sminthopsis crassicaudata ferruginea*, but a detailed diagnosis is deferred pending further investigation.

Mr. Troughton has recently called attention to the doubts which may arise as to the specific uniformity of some small mammals which in the past have been accorded very wide ranges in Australia. No doubt there is room for close scrutiny in all such cases, but it would be regrettable if an over-free use of specific names were allowed to obscure the fact that several adaptable marsupials have successfully colonised huge tracts presenting a wide range of ecological conditions, without undergoing important structural changes in so doing. That *S. crassicaudata* is one such, I hold to be certain.

Dimensions of *S. crassicaudata centralis*, in mm.

	Mean of 13 ♂	Mean of 7 ♀	Largest ♂	Largest ♀
Head and body	70.9	74.0	83	83
Tail	70.1	67.3	66	64
Pes	16.0	15.3	16	15
Ear	20.4	20.4	21	21

SMINTHOPSIS LARAPINTA (Spencer) (var.?)

"*Melatjhania*."

This species appears to be much less numerous than the "Nilce," from which, however, it does not seem to be distinguished by any important features of habits or distribution, though it should be observed that such matters tend to be obscured in a time of general increase. It was stated by Mr. Byrne that at Charlotte Waters *larapinta* lives on the stony tablelands, and *crassicaudata* on the sandhills and creeks.

In a superficial view it comes rather close to *crassicaudata centralis*, and dorsal colour, face and ear-markings are almost exactly as in the intermediate specimens of the latter. From this animal, however, it is sharply separated at all stages of growth by its much longer tail, which exceeds the head and body by 25-30%, by the shorter, more rounded ear, and especially by the interdigital pads of the pes which are always surmounted by a large oval tubercle, exceeding the granules which surround it by 3 or 4 diameters. They are smooth or very obscurely striate.

Mammæ 8.

(6) Co-existing, however, with duller individuals.

On comparing it with the typical *larapinta* described by Sir Baldwin Spencer from Charlotte Waters, I have been able to support his description by examination of a series of six in the South Australian Museum from an unknown locality,<sup>(7)</sup> and of four from the type locality, kindly made available by Mr. Brazenor, of the National Museum, Melbourne. In the chief structural features, the correspondence with the animal from the Lake Eyre Basin is close. The incrassation of the tail and its resulting shape, however, are much less characteristic than Spencer supposed. In two examples from the Diamantina the tail is as slender as it is in *murina* and in two others in which it is incrassated, it is not very differently shaped from that of *crassicaudata*.

The hallucal pad of Spencer's animal is not a prominent feature in the present series, and the V-shaped smooth elevation surmounting the basal pad of the manus is less sharply sculptured, and its arms tend to coalesce across the intervening space. The differences in colouration between the two series are much the same as those separating the forms of *crassicaudata* from the same localities; *i.e.*, those from the Lake Eyre Basin are paler, with a pure white rather than cream belly, and the brown and tan shades of Spencer's animal are here replaced by pinker hues of ocraceous buff.

The skull of the Lake Eyre animal does not differ in any constant way from that from Charlotte Waters; it is strongly built and more densely ossified than in *crassicaudata* and in old specimens develops distinct crests; the disparity in size of the premolars is also more marked, than in *crassicaudata*.

Dimensions of the largest ♂ and ♀ examined:—Head and body, 90, 83; tail, 110, 105; pes, 18·5, 17; car, 18, 17.

The skull of the largest male gives:—basal length, 26·5; width, 25·2; nasals, 10·0; palate, 14·1; M<sup>s1-3</sup>, 4·6.

Five specimens examined.

So little is known of the range of *S. larapinta*, and the few specimens examined have come from such restricted areas, that I do not feel justified at present in claiming the animal as a definite variety, though it is quite probable that such is the case.

The probability of its occurrence in South Australia was pointed out by Wood-Jones,<sup>(8)</sup> but the above notice is the first definite record of the animal in this State.

#### CHAETOCERCUS CRISTICAUDA HILLIERI (Thomas).

##### "Mudagoora."

This beautiful dasyurid, which until now has been known from a single skin in the British Museum, is apparently widely distributed in the arca, but during my time there, was not plentiful. It makes its rather shallow burrows chiefly in the sandhill country, and although many were excavated, most of them proved to be deserted, and only a single specimen was then obtained (at Cooncherie). Some few months later, however, its numbers had greatly increased, and seven more examples were forwarded by Mr. G. Aiston, from Mulka, and Mr. D. N. George, from Puttaburra. Moreover, examination of the entire *chaetocercus* collection of the South Australian Museum has brought to light further specimens taken in the same district in 1905, so that altogether 16 have been available for examination.

In their pallid buff colouration, these agree very well with Thomas' *hillieri*, except that the under-surface of the tail is jet black for two-thirds its length and

(7) These were probably obtained (together with some other Dasyurids) from Sir B. Spencer, by exchange, by the late Mr. Zietz, and they probably represent part of the original collection from Charlotte Waters.

(8) Mammals of S. Aust., vol. i., p. 111.

not simply "indistinctly darker," as stated. In estimating its relation to the typical *cristicauda* of the more westerly districts of the Centre, I have had an excellent series of 104 examples of the latter from as far north as Tennant's Creek, south to Ooldea, and west to about 124 E. longitude, in Gibson's Desert. Examination of the whole of this material shows definitely that (1) all specimens reliably localised in the Lake Eyre Basin show the *hillieri* pelage characters very constantly; (2) west of the Basin, *cristicauda* is very variable, but is nearly always much darker and more grizzled, and even its palest phases are more richly coloured and have a more strongly contrasted tail base than in *hillieri*; (3) the two colour types do not co-exist in any part of the range of the species as at present ascertained.

These results leave little doubt, therefore, that Thomas' animal constitutes a valid geographical race of constant pelage characters within the limited area to the east of Lake Eyre, from which it has so far been taken.

Structurally, the present form seems to be practically identical with the western animal, or at least it presents a range of variation in structural features which can be merged in that of the latter. When the skulls of the four largest examples of *hillieri*, taken in the winter of 1932, are compared statistically with a long series of adults of the western form, some small *proportional* differences emerge; thus (1) the degree of intertemporal constriction is greater; (2) the palatal vacuities are larger; (3) the canine is longer; and (4) the molar dentition is slightly weaker, than in *typica*. The differences are slight, however, and do not afford sufficient grounds for founding specific distinctions upon, and the animal is best regarded as a well-marked variety of Krefft's species.

It does not seem to have been noted previously that the unworn canine of *chaetocercus* usually carries a small but distinct cusp upon its posterior carinate margin. The feature is reminiscent of that seen in some bats, and is present in both sub-species.

With regard to dimensions, it is unfortunate that the almost incredible variation in adult size and to a lesser extent in proportions, which is especially characteristic of *Chaetocercus* amongst the Central mammals, largely stultifies any attempt to define the two forms by mensuration. The series of 7 males, taken during the winter of 1932, are far larger and bulkier than any which I have examined from the western areas, but that superior size is not a distinguishing character of *hillieri* is proved, on the one hand by the fact that adults taken in 1905 are very much smaller than 1932 examples, and on the other by the existence of Spencer's record of a giant *typica* male from Charlotte Waters with a head and body length of 220 mm., which greatly exceeds the largest of my *hillieris*.

*Flesh Dimensions*.—Range of 8 ♂, taken in 1933: Head and body, 164-190; tail, 113-130; pes, 34-37; ear, 26.5-28. Range of 4 ♂, taken in 1905:<sup>(9)</sup> Head and body, 123-141; tail, 85-109; pes, 29-31; ear, 22-25.

*Skull Dimensions*.—Range of 4 ♂ taken in 1932, followed by two ♀ taken in 1905:—

Basal length: 39.5-42.2, 35.3-37.1; zygomatic breadth: 28.2-30.3, 25.2-25.8; nasals length: 14.3-16.0, 13.2-14; nasals breadth: 5.6-6.7, 4.5-5.0; constriction: 7.0-7.5, 7.1-7.2; palate length: 21.2-23.2, 20.0-20.5; palate breadth outside M<sup>3</sup>: 14.1-15.0, 13.3-13.6; palatal foramina: 2.5-3.0, 2.5-2.8; palatal vacuities: 6.5-7.0, 5.5; height of canine: 4.7-6.8, 4.5; Ms<sup>1-3</sup>: 8.2-8.8; 8.2-8.5; Max. breadth of M<sup>3</sup>: 3.5-3.6, 3.5-3.6.

<sup>(9)</sup> Although no females were taken in 1932, it is almost certain that differences in dimensions shown are seasonal rather than sexual. In the western race sexual differences, though present, are not very marked.

Sir Baldwin Spencer states<sup>(10)</sup> that females of *chaetocercus cristicauda typica* were much more plentiful than males, but this is not borne out by the results of my own observation on this race, and in *hillieri* the position is reversed, as of the 17 specimens now known, 12 are males, and, as mentioned, during the last period of their plenty, only males were taken. Without more detailed knowledge of the life histories and habits than is at present available, however, the determination of sex ratios by simple examination of series of wild, caught specimens is not very satisfactory.

During the rodent plagues, the animal appears to be almost entirely carnivorous, and the stomach contents of all those examined consisted largely of finely comminuted fleshy matter with only a sparse representation of insect debris. Like its larger relative *Sarcophilus* it crushes and ingests large quantities of bone, but the fur which is commonly found in large quantities in the stomach of the latter, is conspicuously absent.<sup>(11)</sup>

DASYUROIDES BYRNEI PALLIDOR (Thomas).

"Kauäri."

Well known to both the settlers and blacks, but apparently a comparatively rare form which has not participated in the general increase in numbers. No specimen was taken, and the single example of the species in the South Australian Museum represents the darker typical race.

The Dieries, on the Barcoo, speak of a spotted animal, the Yikaura, which was a rare form when they were boys, and which has not been seen for many years; it was, no doubt, a *Dasyurus* species. With this exception no definite accounts could be obtained of any other members of the family, though it is probable that *Antechinomys* occurs here.

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<sup>(10)</sup> Horn Expedition Reports, Mammalia, p. 25.

<sup>(11)</sup> Cf. Wood-Jones Mammals of S. Aust., pt. i., p. 108.